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10/790,138	03/02/2004	Byung-cheol Song	Q79455	3019

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EXAMINER
WERNER, DAVID N

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS,
WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 April 2009*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13 and 16-21* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13 and 16-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 September 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All   b)☐ Some * c)☐ None of:

        1.☒ Certified copies of the priority documents have been received.

        2.☐ Certified copies of the priority documents have been received in Application No. _____.

        3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

1.   This Office action for U.S. Patent Application 10/790,138 is responsive to communication filed 17 April 2009, in reply to the Non-Final Rejection of 18 December 2008. Currently, Claims 1–13 and 16–21 are pending.

2.   In the previous Office action, Claim 17 was objected to for failing to limit parent claim 1. Claim 18 was objected to for failing to limit parent claim 6. Claim 19 was objected to for failing to limit parent claim 11. Claim 20 was objected to for failing to limit parent claim 12. Claim 21 was objected to for failing to limit parent claim 13. Claims 1–5, 13, and 16 were rejected under 35 U.S.C. 101 as non-statutory. Claims 1–3, 6–8, 11–13, and 16–21 were rejected under 35 U.S.C. 103(a) as obvious over US. Patent 5,539,466 A (Igarashi et al.) in view of U.S. Patent 5,731,850 A (Maturi et al.), U.S. Patent 5,168,356 A (Acampora et al.), and U.S. Patent 5,185,819 A (Ng et al.). Claims 4, 5, 9, and 10 were rejected under 35 U.S.C. 103(a) as obvious over Igarashi et al. in view of Maturi et al., Acampora et al., and Ng et al., and in view of U.S. Patent 5,878,166 A (Legall).

Response to Amendment

3.   Applicant's amendments to the specification have been fully considered. The rejection of Claim 13 under 35 U.S.C. 101 is withdrawn.

4.   Applicant's amendments to the claims have been fully considered. The rejection of Claims 1–5 and 16 is withdrawn.

Response to Arguments

5.   Applicant's arguments, see page 13, filed 17 April 2009, with respect to Claims 17–20 have been fully considered and are persuasive. The objections to Claims 17–20 as failing to limit parent claims have been withdrawn.

6.   Applicant's arguments filed with respect to claim 1 have been fully considered but are moot in view of new grounds of rejection. Although the examiner does not concede the alleged inapplicability of the Igarashi reference as described in the responses filed 17 April 2009 and 16 September 2008, in the interest of advancing prosecution, the reliance on the Igarashi reference is withdrawn. However, it is respectfully submitted that the Maturi reference discloses the claimed steps of calculating forward and backward SADs, and determining a minimum SAD value. In addition, although the Acampora reference selects an interpolated mode according to a ratio of forward and backward distortions if forward and backward mode distortions are above a threshold, the method of Acampora does not calculate an interpolated distortion itself in selecting the bidirectional mode.

Claim Rejections - 35 USC § 103

7.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8.   Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,731,850 A (Maturi et al.) in view of U.S. Patent 5,168,356 A (Acampora et al.) and U.S. Patent 5,185,819 A (Ng et al.).

Maturi et al. teaches a motion estimation system for an MPEG encoder. Regarding Claim 1, in Maturi et al., as shown in the table in column 12: for both a forward and backward direction in a macroblock in a B-frame, SADs are determined for the entire macroblock, that is, the claimed forward frame SAD and backward frame SAD (column 11: lines 41–59). The encoder also determines motion vectors and SADs from the odd field in a reference block to the odd field in the current frame (odd-odd), even-even, odd-even, and even-odd. The odd-odd and even-even field SADs are then cumulated in each direction (column 12: lines 4–10). This is the claimed receipt of the sum of the forward field SADs and the sum of the backward field SADs. Then, Maturi et al. teaches step (a)[1]. Maturi et al. then determines the minimum SAD for the block (column 12: lines 28–32). This is step (b). However, the present invention differs from Maturi et al. in that in the present invention, the minimum SAD is checked against a threshold, whereas in Maturi et al., the minimum SAD is assumed to be always associated with an acceptable motion vector.

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[1] Applicant disputed an interpretation similar to this in the remarks filed 28 September 2007 in response to a 102(b) rejection of claim 1 in the 28 June 2007 Office action, resulting in the inclusion of the Igarashi reference in the 12 December 2007 Office action to show a more clear determination of "frame" and "field" motion vectors. However, upon further review of the Maturi reference, particularly the description of the accumulation of odd-odd and even-even SADs as an alternative to an independent calculation of an SAD for an entire macroblock (column 12: lines 9–11) that is calculated "concurrently" to the four field MVs and SADs (column 11: line 59), the examiner believes that the "entire macroblock" MV and SAD calculation of column 11: lines 44–45 is indeed a frame calculation, distinct from the accumulated field calculations.

Acampora et al. teaches a video encoder. This encoder includes element 104 which calculates a forward frame motion vector (column 7: lines 44–52), element 105 which calculates a backward frame motion vector (column 7: lines 53–56), and analyzer 106 which compares the distortion, for an example an SAD value as in Maturi et al., produced from the forward and backward motion vectors to a threshold (column 7: lines 57–58). If both the forward and backward frame distortions are larger than a threshold, a weighted interpolative frame is generated from the ratio of the two distortions (column 7: lines 57–66), rather than determining the distortion of an interpolative frame motion vector, and so is "without using an interpolative frame SAD". This is step (d). If both single-direction frame motion vector distortion signals are below the threshold, the motion vector that produces the smaller distortion is selected (column 7: line 67–column 7: line 3). This is step (c).

Ng et al. discloses a field mode version of the forward and backward motion vector generators and analyzer of Acampora et al. (column 7: lines 1–28). In particular, in Ng et al., element 104 calculates forward field motion vectors (column 7: lines 1–9), element 105 calculates backward field motion vectors (column 7: lines 10–14) and Analyzer 106 compares the distortion signals from the forward and backward motion vectors, and encodes the motion vector with the lower distortion if below a threshold (column 7: lines 24–28) or an interpolation of the two motion vectors if above a threshold (column 7: lines 10–23). Once again, although Ng et al. determines a ratio of forward and backward motion vector distortions, it does not calculate a separate unitary distortion of the interpolated motion vector.

Maturi et al. discloses the claimed invention except for producing an interpolated frame or field if the SADs of the single-direction motion vectors are above a threshold. Acampora et al. and Ng et al. teach that it was known to produce an interpolated data block from the distortions of the single-direction motion vectors if the motion vectors are above a threshold. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to add the motion vector analyzers of Acampora and Ng et al. to the video coder of Maturi et al., since Acampora et al. states in column 7: lines 57–67 that such a modification would produce a less distorted inter picture than from motion vectors alone if the motion vectors are unreliable.

Regarding Claims 2 and 3, in Maturi et al., the minimum SAD is determined in the forward and backward directions for both the entire macroblock, producing a frame mode, and from combinations of fields, producing a field mode (column 12: lines 28–32; table).

Regarding Independent Claim 6, Figure 2 of Maturi et al. illustrates the encoder. Since Motion Estimator 56 computes the SADs of field and frame forward and backward motion vectors (column 11: lines 30–32) and determines the minimum SAD (column 11: lines 43–44). Then, Motion Estimator 56 comprises the claimed SAD receiving unit and minimum value judgment unit. Encoding Decision Block 66 which determines the coding mode for the macroblock (column 6: lines 30–33) based on information from Motion Estimator 56 is the claimed "first selection unit". Analyzer 106 of Acampora et al. or Ng et al. is the claimed "second selection unit".

Regarding Claims 7 and 8, in Maturi et al., the minimum SAD is determined in the forward and backward directions for both the entire macroblock, producing a frame mode, and from combinations of fields, producing a field mode (column 12: lines 28–32; table).

Regarding Claim 11, in Maturi et al., Motion Estimator 56 comprises the claimed forward and backward SAD calculation units and Encoding Decision Block 66 comprises the claimed MC mode determination unit.

Regarding Claim 12, in Maturi et al., Motion Estimator 56 comprises the claimed forward and backward SAD calculation units, as well as the claimed "SAD receiving unit" and "minimum value judgment unit" in the MC mode determination unit in the MC mode determination unit. Encoding Decision Block 66 comprises the claimed "first selection unit". Analyzer 106 of Acampora et al. or Ng et al. is the claimed "second selection unit".

Regarding Independent Claim 13, at least Ng et al. operates on a modified MPEG-1 encoder, which was known in the art to be implemented on "personal computer and workstation display" (column 1: lines 20–21).

Regarding Claims 16–21, in Acampora and Ng, an interpolated field or frame macroblock is based only according to the existing forward and backward motion vectors and SADs, not a de novo calculation of interpolative or bidirectional data (Acampora, column 7: lines 59–68).

9.   Claims 4, 5, 9, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maturi et al., Acampora et al., and Ng et al. as applied to Claims 1 and 6 above, and further in view of U.S. Patent 5,878,166 A (Legall). Claims 4, 5, 9, and 10 are directed to selecting an interpolated field mode or interpolated frame mode based on SAD statistics. Acampora et al. teaches only interpolated frame motion compensation, and Ng et al. teaches only interpolated field motion compensation.

Legall teaches a video encoding method. Regarding Claim 4 and 9, in Legall, a choice is made for each frame whether to encode the frame in a frame mode or in a field mode (column 3: lines 24–29). In addition, in a frame mode, individual macroblocks may be encoded in a field mode or a frame mode (column 3: lines 24–29). In addition, in a frame mode, individual macroblocks may be encoded in a field mode or a frame mode (column 10: line 63–column 11: line 14). This decision is made by comparing a "frame activity" measure, which is the sum of absolute differences for every pixel in a block, and the sum of the two "field activity" measures (column 8: lines 41–54). If the frame activity is less than the field activity, a macroblock is encoded with frame encoding, but otherwise a macroblock is encoded with field encoding (column 11: lines 7–14). This is the claimed comparison of the sum of forward frame SAD and backward frame SAD and the sum of forward and backward field and frame SADs in Claims 4 and 9. Regarding Claims 5 and 10, the ratio of the forward and backward SADs described in Acampora et al. and Ng et al. may be the claimed "predetermined condition made by

combination of SADs", or alternatively, this may be the frame and field activity measurements in Legall.

Maturi et al., in combination with Acampora et al. and Ng et al., discloses the claimed invention except for determining whether to encode a block in a field mode or frame mode based on total SAD values of the field mode or frame mode. Legall teaches that it was known to make a field mode/frame mode determination for a macroblock based on comparing total SAD values of a frame and the sum of the SAD values of two fields. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to choose between frame mode and field mode based on total SAD activity, as taught by Legall, since Legall states in column 3: lines 24–54 that such a modification would enable an encoder to adapt to an optimized encoding mode with a more stable bit rate depending on the amount of movement in a video.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner whose telephone number is (571)272-9662. The examiner can normally be reached on Monday-Friday from 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. N. W./
Examiner, Art Unit 2621

/Dave Czekaj/
Primary Examiner, Art Unit 2621